

# More than wheat – the market potential of currently underutilised cereal crops

Bernadette Oehen<sup>a</sup> and Heidrun Moschitz<sup>a</sup>

<sup>a</sup>FIBL–Research Institute of Organic Agriculture, [bernadette.oehen@fibl.org](mailto:bernadette.oehen@fibl.org), [heidrun.moschitz@fibl.org](mailto:heidrun.moschitz@fibl.org)

**Abstract:** *Diversity in arable production across Europe has been on the decline, with only a few varieties of common wheat, maize and barley accounting for more than 85% of the cereals produced in the EU-28 in 2015. The focus on only a few crops has shown to increase the risk of production loss due to pests and diseases. We conducted case studies of regional market initiatives in four countries to understand the success factors as well as challenges faced by initiatives aiming to increase cereal diversity and promote minor cereal crops. The four initiatives studied were involved with the production and trade of rye, oats, spelt, emmer and einkorn. The major success factors for these initiatives was the niche marketing approach used combined with the skills and expertise of those involved as well as the knowledge and a network of external actors. These assets allowed the initiatives to organise a niche market and build up long lasting relationships all the actors, invest in a reliable market planning and focus on consumer trends and needs. The major limitations for the development of the supply chains included the lack of adapted processing technology and infrastructure as well as restricted access to seeds. The examples described here help to increase the diversity of European cereal production.*

**Keywords:** *oats, spelt, crop diversity, cereal production, niche marketing, HMC*

## Introduction

According to Eurostat (2017), the EU-28 countries harvested around 301 million tonnes of cereals in 2016, making it one of the largest cereal producers in the world. Even if there are regional differences, common wheat (*Triticum aestivum*), grain maize (*Zea mays*) and barley (*Hordeum vulgare*) are the most important cereals grown in the EU. These three crops (maize only corn cob mix) account for 85.6% of the cereals harvested. Wheat accounts for 44% of the total cereal harvest and is by far the most popular cereal crop, followed by maize (20.8%) and barley (19.9%). With regard to the area, wheat was cultivated on more than 42% of the agricultural area dedicated to cereals, 15% was used for maize production and about 20% for barley. In terms of value, in 2016, cereals represented more than 11% of total agricultural output in the EU and accounted for 21% of EU crop production (Eurostat 2017). Hence, wheat, grain maize and barley are essential commodities for Europe and traded at large scale (Uhl et al., 2016).

The productivity of European arable farming is based on a relatively small number of crop species and varieties (Newton et al., 2010). Today, European agriculture is challenged by a loss of agro-biodiversity, which makes the production system more vulnerable to biotic and abiotic stress (Janovska et al., 2017; Ceccarelli, 2014; Newton et al., 2010). Cereals are traded globally, at large scale and by a few traders to supply the food industries. Origin hardly plays a role in the world of internationally traded cereal commodities, and a link to local production is difficult to establish.

However, there are current trends in food consumption towards regional production, traditional methods and crafted food that show in an opposite direction.

Currently underutilised or minor cereal crop plants (MC) are rye, oats, spelt but also emmer and einkorn. In the EU funded project *An integrated approach to diversify the genetic base, improve stress resistance, agronomic management and nutritional/processing quality of minor cereal crops for human nutrition in Europe* (HMC; <http://healthyminorcereals.eu/>) these crops were further bred and evaluated in different locations. The project aims at offering farmers improved seeds of minor cereal crops to increase cereal diversity on arable land in Europe. As the farmers need a market perspective, the market potential of selected underutilised cereal crops was addressed. By identifying successful market initiatives involved in minor cereal crop production or trading, recommendations for the marketing of the varieties were developed.

## Methods

Given the fact that the European cereal market is well organised towards large-scale volumes, the marketing of minor cereal crops could be challenging. The underlying hypothesis for this study was that minor cereal (MC) crops could be successfully introduced in a niche market. By using a case study approach, successful market initiatives in the selected four countries were identified, and interviews with different actors of the value chains (e.g. seed companies, farmers, traders/collectors, processors and retailers) were conducted. Data on MC production, marketing experiences, the people involved and their specific skills as well as factors that support or impede marketing efforts were collected and analysed by using the niche marketing attributes developed (Dalgic&Leeuw, 1993, 2006):

- Market organisation balance with the market and their internal resources;
- Consumer-oriented organisation
- Long-term relationships
- Continuous process and learning

During winter and spring of 2015/16, data collection was carried out by national teams using face-to-face interviews, participant observation, focus group discussions and analysis of various documents. The preliminary results were verified in workshops and group discussions conducted with key persons of each of the case studies.

Case studies were conducted in the Czech Republic, Estonia, Hungary and Switzerland. They selected based on the following criteria:

- HMC breeding activities in the respective country,
- Relative relevance of MCs in the country's arable production,
- Access to information on cereal marketing experience as well as access to data on cereal production and area.

Based on the breeding activities done in the selected countries, the type of cereal crop was selected: spelt in Switzerland and the Czech Republic, einkorn in Hungary and oat in Estonia (Tab. 1).

**Table 1:** Description of the case studies examined in these papers.

Case description				
Country	Estonia	Hungary	Czech Republic	Switzerland
Initiative studied	Cooperative Wiru Vili	Company Naturgold Farms	Company Pro-Bio	Interest Group IG Dinkel
Minor crops investigated	Organic oat	Organic einkorn	Organic spelt	Spelt
Market addressed	Export	Domestic market	Domestic market	Domestic market
Share of cereal area (2012)	>5%	<1%	<1%	>3%

## Description of Companies and Initiatives studied

### Spelt in the Czech Republic

Arable production is a relevant sector in the Czech Republic (Table 2). Similar to other European countries, the main crops produced in the Czech Republic are wheat, barley, corn, rapeseeds and sugar beet. Minor cereals cover about 3% of the cereal production area. This number includes the production of oats, rye and organic spelt. No official data on emmer and einkorn production or spelt produced by non-organic farmers.

Historically, the spelt used to be a common cereal in the Czech Republic. However, during the socialist era, it disappeared from agriculture. The popularity of spelt was renewed after 1990. Currently, spelt represents in the Czech Republic the most successful minor cereal. Information about spelt and agricultural expertise was mainly transferred from abroad. Spelt is very popular in Austria and Germany (which are neighbouring countries of the Czech Republic) and a lot of experience was thus taken from these countries. Generally, spelt is not difficult to grow and can be easily stored after the harvest. Many farmers and consumers see spelt as a synonym for organic agriculture. Currently, there are four varieties of spelt registered in the Czech Republic. Three of them come from other countries than the Czech Republic.

Spelt is currently highly demanded in the Czech Republic and other European countries. Production and processing of spelt thus represent an interesting business opportunity for farmers and food processors. All farms that were observed during the fieldwork were family farms. The production of minor crops seems to be attractive for smaller farms. Larger farms rather focus on crops, which enable them to use the strengths of the intensive agriculture and industrialized processing.

The trading company PRO-BIO is one of the largest manufacturers and processors of organic food. It was established in 1992. The founders of the company were pioneers of organic farming in the Czech Republic and in contact with the organic movement across Europe. The company grew from its modest beginning to currently having almost 160 employees. It owns three mills, several warehouses and packaging facilities, a company store, an online shop and a modern quality control laboratory. However, PRO-BIO is especially known for operating a traditional old mill, which can process oat, spelt, emmer and einkorn.

PRO-BIO sources these cereals through contract farming. The company is currently also active in breeding and trading of seeds for organic farmers, and it provides seeds to the farmers and guarantees them that they will buy the harvested crops.

### Oats in Estonia

In Estonia, only 22.2% of the country's area is used for agricultural production (Table 2). Oats and rye have historically been cultivated in Estonia whose natural conditions are quite suitable for growing these crops. Today, the most important cereals produced are wheat and barley. Oats and rye make up 8.6% of the total cereal production area and 99% of the total production area of minor cereals. Spelt is produced on a very small scale, and mainly organic.

Only 50 - 60% of the arable land in Estonia is characterized by a high level of fertility, where it is possible to foster competitive agricultural production. The share of low fertility, drought-prone, nutrient-poor acid soils is relatively large. Oats is not demanding with regard to soil nutrient content, it is resistant against plant diseases and - thanks to wide leaves - suppresses weeds. Oats in Estonia was historically used for animal feed. Today, oats is used for human consumption, with a remarkable part for baby food. However, the prevailing part of the organic oats in Estonia is grown for exports.

By 2016, 1'543 organic producers were cultivating organic products on a total of about 16% of all the agricultural land in use. In recent years, a considerable increase in market demand has been observed, with consumer interest in organic food growing. Similarly, organic processing and marketing activities have developed. Nevertheless, the stakeholders in the organic sector still consider the under-developed processing capacities (e.g. small number of processors and small production volumes) to be the main obstacle for the further development of the organic sector in Estonia.

The farmers' cooperative Wiru Vili, founded in 2009, is a (the) main actor among Estonian oat producers. At that time, Estonian organic farmers wanted to sell about 500 tons of organic oats. None of the Estonian traders was interested. So farmers organised themselves in a cooperative and started to trade cereals directly, exporting mainly to Germany. Since 2015, the cooperative exports Estonian organic cereals to North America, as well. The success of Wiru Vili is directly related to the high quality of the product, which is attained thanks to a quality assurance program. The quality for every single delivery is checked. It is the cooperative's goal to guarantee best prices for their producers. The founders of the cooperative are visionaries and hold on to their dream of making high quality and affordable organic products also available to local communities.

For Wiru Vili, cooperation among the organic farmers is crucial: e.g. joint ordering of production inputs, joint planning of drilling s, evaluating the quality during the growing season and finally – pooling the crop, sorting it, storing and drying, and preparing for selling. All the activities help in economising costs. Furthermore, selling pooled crops is much easier as the markets demand bigger volumes, which cannot be achieved while selling the crops individually.

### **Einkorn in Hungary**

In Hungary, 58.9% of the land is used for agriculture, and more than 80% of that is arable land (Table 2). Cereals, mainly wheat and barley, are by far the most important crops, covering about 50% of the arable land. Oats, rye, durum wheat, spelt, emmer and einkorn in total cover about 2% of the area dedicated to cereal production (KSH 2018). Hungarian arable farming has a huge potential regarding soil quality and climatic conditions. Agriculture has traditionally been an important sector of the nation's economy.

Similar to other Central and Eastern European Countries like Poland or Ukraine, Hungary is a significant producer of organic products, with a relatively small domestic market. About 85% of the organic production is exported. Most of the products leave the country as raw materials. Most of the (modest) organic assortments in Hungarian food stores are imported processed products. Some estimates suggest that 90% of domestic organic consumption is made up of imports.

The company Naturgold Farms is the number one spelt, einkorn and emmer trader in Hungary and the second largest trader of hulled grains in Europe. The Hungarian einkorn market is small and considered a niche market. The few core players know each other well, but close cooperation is not typical between them. The available einkorn varieties in Hungary were bred through two breeding projects aiming at testing einkorn varieties, and landraces from the Hungarian gene bank for their performance in organic farming. The company Naturgold Farms purchased the ownership rights of the two most popular einkorn varieties. By buying the variety owner rights, the company could secure its position as a market leader in the trade and processing of einkorn. The company also buys einkorn from other European countries. However, 90% of the einkorn traded by the company is exported in bulk. Producers purchasing seed from Naturgold Farms need to sign a contract that grain produced from the seeds can only be sold to them. The only exception here is one large organic farm, which sells its einkorn to the beer brewing industry. Today, Naturgold Farms is not accepted by all farmers because some want to avoid business relationships with them. It causes unnecessary fragmentation within the stakeholder groups.

## Spelt in Switzerland

In Switzerland, grassland accounts for 70% of the utilised agricultural area (Table 2). The most important cereal crop is wheat followed by barley, maize and triticale. During the last decades, breeders have focused on improving wheat varieties used for bread and industrial processing as well as adapting the varieties to the cold and rainy growing conditions of the north and central part of the country. However, historically, spelt was the most relevant cereal produced in these regions because the crop was well adapted to the low fertility of the soils and the harsher climate and because it provided straw that was needed for animal husbandry. After years of decline, spelt today is cultivated on 3% of the area dedicated to cereal production. It remains the second most important cereal used in bread, after wheat. Rye and oat are cultivated each on less than 3% of the area dedicated to cereals.

Though 13.5% of total UAA is dedicated to organic production (Willer et al. 2017), the organic sector in Switzerland is not the relevant actor when it comes to trading spelt. The relevant actor is the so-called Interest Group Spelt (IG Dinkel). It was founded by farmers, millers and researchers in 1995 after the Swiss government announced the liberalisation of the domestic cereal market. The spelt producers and de-husking millers were worried about a further substitution of spelt with common wheat. Especially in some marginal areas for cereal production in the cantons Bern, Lucerne and Argovia, farmers and millers wanted to keep spelt in their crop rotation as additional income, and for the straw and husks, they needed for the cattle production.

In 2016, the IG Dinkel had about 1720 members, 1650 are farmers, 70 millers and two bakeries. The IG controls 70% of the spelt market in Switzerland. All spelt traded by the IG Dinkel originates from a "traditional area". In concrete terms, this means that the growers must be located within the immediate vicinity of one of the traditional de-husking mills. Thus long transport routes can be avoided and the commercial, mostly family-run, de-husking mills obtain regional protection. The IG Dinkel owns the trademark "UrDinkel" (PureSpelt) which is a third-party-certified product label. According to the label guidelines, only two spelt varieties are allowed to be traded as "UrDinkel". The main producers of UrDinkel are so-called IP Suisse farmers. IP Suisse stands for integrated production, mainly meaning a reduction in pesticide use and several measures to protect biodiversity.

**Table 1** Agricultural land use in the four European countries where case studies were conducted. UAA: utilised agricultural area. (Source: Eurostat, 2010, Willer et al., 2017). \*Land use data in Switzerland includes alpine agricultural area. Without, UAA is about 23.4%.

Description	Estonia	Hungary	Czech Republic	Switzerland
UAA (% of total area)]	22.2%	58.9%	54.8%	35.7%*
UAA (Mio ha)	1 ha	5.3 ha	3.5 ha	1.05 ha
Arable are (% of UAA)	67%	81%	72.3%	29%
Cereal area (Mio ha)	0.3	2.6	1.4	0.1
Cereal area (%arable land)	29.2%	60%	56%	13.7%
Organic area (% of UAA)	16.5%	2.4%	11.3%	13,1
Organic cereals (% of cereal area)	9%	0.9%	2%	3%

## Results

### Policy and market environment

The diversity of cereal crops in all four countries was found to be low with wheat and barley as the most abundant crops. Only limited data on the production of einkorn, emmer or spelt was available. In Switzerland, spelt is produced on a larger area than oats or rye, even though the area planted with spelt is still much smaller than the area used for wheat

production. Based on market data from Hungary, the area planted with organic einkorn is about 200 ha compared to about 5000 ha organic wheat.

In all cases, there is currently no specific policy supporting market development of MC apart from agri-environmental subsidies supporting (extensive or organic) production. Financial support is given to producers of certain crops (potatoes, hops, fruits, vegetables, sugar beet, and protein-based plants) and livestock, but no financial support is given to producers of rye, oats or spelt. Some cooperatives and companies profited from investment aid for modernisation of agricultural holdings and infrastructure or rural development.

About crop diversification, the private label owners Bio Suisse and IP Suisse require in their standards that farmers promote biodiversity with various measures. One measure is the cultivation of agrobiodiversity by the production of underutilized crops like spelt, emmer or einkorn.

The agricultural sector in the Czech Republic, Hungary and Estonia has changed dramatically on a technical, social and economic level since 1990. There is a high concentration of land ownership, e.g. in the Czech Republic, 4% of the agricultural holdings farm approximately 70% of the overall agricultural land (or 19% farms larger than 100 ha produce on 89% of the utilised agricultural area). The supply chains and food processors are accustomed to cooperating with the large agricultural holdings. In Estonia, holdings with less than 5 ha of agricultural land made up 35.9% of agricultural holdings but they operated only on the 1.8% of the utilised agricultural area. On the contrary, the holdings with more than 100 ha of land made up 9% of the total number but they operated on the 73.2% of agricultural land. Also Hungary shows the same polarity: small holdings with less than 5 hectares of agricultural area farmed only 6% of the Hungarian agricultural land in 2010. On the other end of the scale, 1% of the agricultural holdings larger than 100 ha produced on 65% of the utilised agricultural area in 2010.

In the Czech Republic, Hungary and Estonia, the organic sector has developed rapidly after the countries joined the EU. In these countries, the organic sector is the main market channel for the crops selected in the case studies. In Switzerland, the IG spelt mainly trades IP Suisse spelt, which is not organic.

In all countries, the interviewed experts identified supermarkets as the main supplier of food to consumers and in some countries (Estonia, Switzerland) a strong the competition in the national retail food market was reported. Especially organic food is sold particularly also in smaller stores, farm shops or pop-up markets where producers and consumers meet face-to-face.

### **Aspects of niche marketing**

By comparing the cases by the concept of niche marketing (Dalgic&Leeuw 1993, 2006), we found interesting parallels and contrasts.

**Market organisation balance with the market and their internal resources (Tab. 3):** In all the cases studied, the actors involved either had important knowledge and expertise concerning the organisation and planning of the market themselves or had access to this expertise. To make the market planning more reliable, production is done under contract to control demand and supply. Most of the companies produce for the domestic markets, one company focuses on exports.

In the Czech Republic, Switzerland and Hungary, the market planning includes seed supply. Here, we see different strategies: IG Spelt prescribes exactly those varieties that are allowed for production under the label PureSpelt. They care for seed multiplication and farmers have access to seeds via the official seed market. The company in Hungary controls the access to the best einkorn varieties. By controlling the quantity of seeds available for farmers, they control the market. In the Czech Republic, the company is also involved in breeding projects and cares for that seeds of cereals they are interested in are available for farmers. In

Estonia, the cooperative is not involved in breeding or seed supply. They depend on the oat seeds available in the country.

**Table 3:** The market organisation balance with the market and their internal resources in the case studies

Market organisation	Estonia	Hungary	Czech Republic	Switzerland
Tools for the market organisation	Contracting	Contracting Buyers of einkorn seeds have to sell the yield back to the company	Contracting	Contracting Survey among processors to identify the market demand.
Markets	Export	Domestic	Domestic	Domestic
Market share		70% of the Hungarian market with spelt, emmer and einkorn.		70% of the Swiss spelt markets
Seed supply	Official registered oat varieties	Control of seed multiplication and trade.	Own breeding projects Farmers are supplied with seeds	Planning of seed multiplication Prescription of the seeds to be used for production

**Consumer-oriented organisation (Tab. 4):** The investigated cases use popular consumer trends like sustainably produced, tradition, health, taste, high quality, or local production in their marketing strategies. Different from large-scale cereal traders and processors, the cases analysed here were able to connect their products to local production and sustainable production.

In the three cases from the European Union, the organic label is used to inform consumers about the specific quality of the product. In the Czech Republic and Hungary, the company brand is also used. In Switzerland, the organic label and the label for integrated production (IP Suisse) is used in the marketing of spelt. Also, the IG Dinkel developed an own label PureSpelt, which is also certified by a third party. The Swiss case provides farmers with a field panel the mark their fields as PureSpelt fields.

**Table 4:** The consumer-oriented organisation the case studies

Consumer-related aspects	Estonia	Hungary	Czech Republic	Switzerland
Communication to consumers	Organic label	Organic label Company brand	Organic label Company brand	IP Suisse/Organic PureSpelt
Consumer trends used	Quality Organic	Taste/Colour Organic Domestic production	Tradition Health Taste Organic Domestic production	Tradition Health Sustainability

**Long-term relationships (Tab. 5):** All the four case studies represent examples of marketing cereals where actors were able to build up a relationship with farmers' organisation, supply chains and experts. Besides cereal producers, also processors like millers and bakers are relevant. In Hungary, Czech Republic and Estonia, a cooperation among organic farmers and processors is established.

In some of the case studies, incidents of disappointments were reported leading to mistrust among farmers and managers of the supply chains. This may have limited the market development.

**Table 5:** Long-term relationships in the case studies

Long-term relationship	Estonia	Hungary	Czech Republic	Switzerland
Starting point of the cooperation	Since funding in 2009	Early 90ies	Since founding in 1992	Since founding in 1995
Network	Organic Farmers Organic movement Trader	Organic Research	Organic Farmers Processors Organic movement	Farmers cooperate with regional millers Research
Tools to build up relationships	Meetings		Meetings	Meetings Training Transparent communication

**Continuous process and learning (Tab. 6):** The cases from Switzerland, the Czech Republic and Hungary had to invest in the development of processing as spelt, emmer or einkorn are not adapted to industrial processing, baking and brewing. This was done by cooperation with research partners or/and craft/artisanal processors.

Finding suitable post-harvest processing, handling and storage options for minor cereals posed a problem in the development of all of the four cases studied. In Switzerland, the Czech Republic and Hungary it was also the access to specialised technology for de-husking spelt that made it possible for to increase production volumes and market shares of the minor cereals. Whereas in Switzerland, the necessary technology was still available, supply chain actors in the Czech Republic and Hungary had to invest to build up the de-husking technology. Today, the fact that the initiatives studied have access to these technologies puts them at an advantage in the market and gives them a unique selling position. In Estonia, an investment in adapted storage facilities was needed. As the cereal market is a large-scale market, local infrastructures with sizes adapted to the (usually smaller) quantities of cereals are not available.

**Table 6:** Continuous process and learning in the case studies

Continuous process	Estonia	Hungary	Czech Republic	Switzerland
Product development	Quality of the product	Beer, made from einkorn		Product quality in general Development of spelt bread with a research partner
Technical investment	Investment in storage	Beer brewing	Processing facilities Combination of traditional processes and modern processes	On-line shop
Partner in research projects			HMC Project	Spelt breeding

Important **bottlenecks and challenges** for the success of the marketing of underutilised crops are a lack of adapted infrastructure and technology especially for hulled wheat varieties and the limited availability of seeds.

In addition, farmers do not have the experience, knowledge or the technology to grow a crop and the food industry does not know how to process it. From the farmers' point of view, the decision about production of the minor cereals is a complex problem. Due to the often low development of the supply chain in this area, a lot of issues and questions need to be solved individually, and sufficient yield and related income are not guaranteed.

## Discussion

The work of the HealthyMinorCereal project is re-examining cereals that were extensively grown across Europe in the past before wheat and barley dominated. By developing a market for minor cereal crops, their production should become more attractive for farmers and the area dedicated to the crops could increase. This would contribute to an increased cereal diversity. In the study presented here, cases of marketing of spelt and oats in four European countries were investigated. It is difficult to conclude whether the cases affected the overall crop production in the four countries investigated, as production data about spelt, emmer and einkorn is not available. The re-introduction of spelt in Switzerland could be seen as an example of greater cereal diversity achieved through a market initiative, even though the area planted with spelt is much smaller than the area earmarked for wheat production. Oehen et al., (2014) describe cases of higher cereal diversity in Austria or Italy. In Austria, there are policy measures to promote agrobiodiversity, and in Italy, the market demand for special cereals (such as durum wheat for pasta) probably explains the greater diversity. In none of the countries investigated, a policy instrument in support of more cereal crop diversity is implemented.

In Estonia, the Czech Republic and Hungary, the farmers might profit from support for organic farmers. This is one reason, why MC are traded in organic quality. However, most of the organic products are exported to other European countries. The cases in the Czech Republic and Hungary try to build up a production for the domestic organic market.

All the investigated cases follow a niche market strategy, even though the strategy has been implemented in different ways. While the cases from Estonia, Czech Republic and Switzerland could be seen as a bottom-up development of the market where a core group of small farmers and entrepreneurs developed an innovative business idea in a cooperative way, the case in Hungary stands for a top-down approach, in which one (larger) company started to invest in a new market and contracted farmers to supply the cereals required.

Based on the case study research, we argue that the small companies investigated have an advantage in niche markets in comparison to large firms. Although large companies have sufficient resources, they suffer from high bureaucracy and less creativity and flexibility (Laforet, 2007). They might thus be less innovative regarding the development of new speciality products in niche markets. Smaller companies and cooperatives can take up the consumer trends faster, especially the interest in regional and local production or artisanal processing. Also Akbar et al. (2017) found that even if niche markets are not well defined, they show some characteristics of thinking and acting small by offering small production volumes.

Niche marketing also means the avoidance of large competitors. As the European cereal market operates at large scale, and a few actors supply the food industries with large volumes, mainly wheat, grain maize or barley, MC offer a market niche for entrepreneurs. The economic impact of the production of minor cereal on the involved actors and the regional economy as a whole was not investigated in the framework of the case studies. The reduced productivity of spelt and oats was compensated by a higher market price, which is related to the niche marketing strategy. The higher price was justified by unique intrinsic product qualities, e.g. the sustainability of the production methods, the perceived value of traditional and heritage crops, health or taste. The reduced yield and increasing costs for

processing might limit the development of other cases than the ones described here, especially if market prices would stagnate or decrease because of increased supply quantities. This situation can occur when a big business player enters the market who can quickly supply the demand for spelt, rye and oats.

Part of the crops discussed here were traditionally grown in the country but were (partly) re-introduced, e.g. spelt in Switzerland. However, we also see examples of the introduction of new cereal crops like organic einkorn in Hungary, organic spelt in the Czech Republic or organic oat production in Estonia. The re-introduction of the crops could be considered as an innovation.

A further commonality across all cases studied was that the actors involved either had important knowledge and expertise concerning the organisation and planning of the market themselves or had access to this expertise. It allowed them to establish and expand links to partners and invest in trust-based relationships with the other actors involved, especially the farmers. Three relevant networks were identified: a vertical network of partners in the supply chain; a network providing access to knowledge from research and organic associations; and a network with companies competing (Hungary) or cooperating (Czech Republic, Switzerland) in the same sector. The factor of having access to external knowledge might be underestimated by the niche-marketing model used for the analysis.

This study is of explorative nature. We used a cross-country setting, but the conclusions cannot be generalised for the entire European cereal sector. The current market trends offer opportunities for minor cereal crops in niche markets of different sizes. The consumer interest supports efforts to increase diversity in cereals production (crops and crop varieties) in Europe. Nevertheless, additional support from policy, access to production knowledge for farmers, and particularly interested actors along the supply chains are needed for successful market development.

### Acknowledgement

We would like to thank Zoltán Dezsény, ÖMKI, Lukas Zagata and Jiri Hrabak, Czech University of Life Sciences Prague and Tiiu Ohvril, Tartu, for their research in Hungary, the Czech Republic and Estonia. The project HealthyMinorCereals is supported by the European Union's Seventh Framework Programme under grant agreement no. 613609

### References

- Akbar, F., Omar, A., Wadood, F., Wan Y. and Wan Z. B. (2017) Niche Marketing Strategy Framework for SMEs: A Conceptual Framework. Available at SSRN: <http://dx.doi.org/10.2139/ssrn.2999227>.
- Ceccarelli, S. (2014) GM crops, organic agriculture and breeding for sustainability. *Sustainability* 6(7): 4273-4286.
- Dalgic, T., and M. Leeuw (2006) Niche marketing revisited: theoretical and practical issues. In Proceedings of the 1993 Academy of Marketing Science (AMS) Annual Conference (pp. 137-145). Springer, Cham.
- Dalgic, T., and M. Leeuw (1993) Niche marketing revisited: concept, applications and some European cases. *Handbook of niche marketing: Principles and practice*, 3-12.
- Eurostat (2010) Agricultural census at the EU level. Agricultural census articles by country. [http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural\\_census\\_2010](http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_census_2010) (accessed January 2018).
- Eurostat (2017) Agricultural production – crops. <http://ec.europa.eu/eurostat/statistics-explained/index.php/Agriculture> (accessed January 2018) FAO (2018). <http://www.fao.org/faostat/en/#data/QC> (accessed January 2018).

- IGC International Grain Council (2017): Grain market report 483. 23 November 2017.
- Janovská, D., Chrpová, J., Eiseltová, M., Huta, M., Chour, V., Bilsborrow, P., ... and Oehen, B. (2017) An integrated approach to diversify the genetic base, improve stress resistance, agronomic management and nutritional/processing quality of minor cereal crops for human nutrition in Europe. *Impact* 7: 72-74.
- KSH (2018) Központi statisztikai Hivatal. Zentrale des Statistischen Amtes. [www.ksh.hu](http://www.ksh.hu). [https://www.ksh.hu/docs/eng/xstadat/xstadat\\_annual/i\\_omn001b.html](https://www.ksh.hu/docs/eng/xstadat/xstadat_annual/i_omn001b.html) (accessed Januar 2018)
- Laforet, S. (2008) Size, strategic, and market orientation affects on innovation. *Journal of business Research* 61(7): 753-764.
- Newton, A. C., Akar, T., Baresel, J. P., Bebeli, P. J., Bettencourt, E., Bladenopoulos, K. V., ... & Koutsika-Sotiriou, M. (2010) Cereal landraces for sustainable agriculture. A review. *Agronomy for Sustainable Development* 30(2), 237-269.
- Oehen B., De Gregorio J. and Petrusan J. (2014) Report on the market potential of minor cereal crops and consumers perceptions about them in different European regions. ([www.healthyminorcereals.org](http://www.healthyminorcereals.org))
- Uhl, K., Perekhozhuk, O. and T. Glauben (2016) Price Discrimination in Russian Wheat Exports: Evidence from Firm-level Data. *Journal of Agricultural Economics* 67(3): 722-740.
- Scoppola, M. (2007) Economies of scale and market structure in international grain trade. *Agricultural Economics* 37(2-3): 277-291.
- Willer, H. and J. Lernoud (2017) The world of organic agriculture. Statistics and emerging trends 2017. Research Institute of Organic Agriculture FiBL and IFOAM Organics International. [www.fibl.org](http://www.fibl.org).